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POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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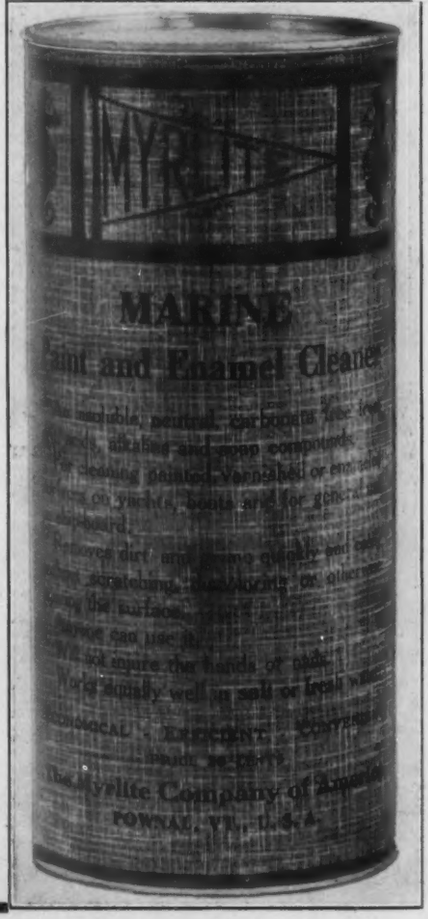

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ELECTRICAL FEATURES—PORTOLA FESTIVAL 1913.

Following the advice of the Electrical Development League to "Do it electrically," ensured the success of the San Francisco 1913 Portola Festival, October 23-26, and the light and color of the spectacular electrical effects were largely responsible for the many glad memories left with those who were privileged to enjoy them, while the "spirit of the West," which is at once expressed in pioneering, thoroughness, and things done better, added many new electrical features excellently executed and at the same time creating a standard difficult to excel.

The first indication of the part electricity was to play in the festival was the decorating in advance of one of the arc light standards, as shown in the accompanying half-tone. A large open-work gilt basket was built around each standard, and this was filled with long-fronded palm leaves, which, together with the scarlet poinsettia, gave to the decorations a grace

Market Street at Third and Kearny—The Mazda Lamp Bell.

peculiarly Californian. A mass of other foliage and artificial flowers filled the baskets to overflowing, while from a point near the top a number of strings of incandescent lamps were interwoven throughout all. Where these lamps escaped from the foliage altogether and hung clear over the edge of the baskets, a considerateness heretofore unthought of had provided frosted lamps to subdue the glare.

Typical Arc-light Standard

There were fitted up in this way 180 arc light standards, each having,—and it was here that the supreme surprise of the electrical decorations, even to the electrical men, was made apparent,—each having one hundred 25-watt Mazda lamps. With the one exception of the electrical floats, but few carbon filament lamps were used, the high efficiency Mazda lamps almost entirely displacing them. The Sunbeam Lamp Works alone supplied over 26,000 Mazda lamps.

This change could not have taken place in order to save installation expense, for where in previous years four candlepower carbon lamps were used, 25-watt, and sometimes 40-watt, Mazda lamps now took their place. It was an evidence of progress.

At night the regular street arcs appeared decidedly bluish by contrast with the myriad Mazdas, and if you wish to mentally conjure up the appearance of the whole, you must picture nearly 200 giant Roman candles, each with its shower of golden rain falling and with blue balls of fire starting up from all. This lane of perpetual pyrotechnics, arrested in action, was banked on either side by buildings ablaze with light; San Francisco's fine showing of electric signs adding greatly to the brilliant effects of light and color. Wherever buildings had found it necessary to relamp existing sockets, and on new installations, high efficiency lamps were used, except where the Portola colors of Old Spain were responsible for subdued lighting, which meant "dipped" lamps and carbon.

At the end of this lane of light rose the Ferry tower, with its 4,000 eight-candlepower carbon filament lamps, many of which were colored. There were also 150 lamps in the "1915" figures, and toward the bay the electric sign, "Panama-Pacific Exposition; California Invites the World," contributed a thousand more Mazda lamps. The electrical department of the Ferry building deservedly gained the prize awarded for the best illuminated building.

At Third and Market streets was installed the mammoth "bell," although at a distance it looked more like a horn of plenty which emptied into the streets a never-ending stream of revelers. This bell was 18 ft. in diameter at the top, 120 ft in diameter at the bottom, where it barely cleared the trolley wires, and was 200 ft. in height. This brilliant centerpiece of the decorative down-town lighting contained three thousand five hundred 25-watt Mazda lamps. By equipping this bell with a double deck, double drum, high-speed flasher, operated by a 1/15 h.p. motor it was given the appearance of revolving.

The fourteen street intersections north of Market, between and including Kearny street and Grant avenue, to California, Stockton, O'Farrell, Powell and Ellis streets, added 3500 additional 40-watt Mazda lamps, the decoration consisting of a basket, the same in design as that installed on the arc-light standards, suspended above the center of the street, with strings of fancy red-colored paper shaded lamps to each corner building. Other sections, Chinatown and outlying districts all contributed their quota of electrically illuminated buildings.

Union Square, which was the center of festival ceremonies, the vantage point from which to view the daylight fireworks, and also the fireworks park, was decorated by Japanese, the decorations being typical of that race. The hundreds of Japanese lanterns were lighted with carbon lamps, but the canopy of the Sampan, or houseboat, used as a bandstand and for ceremonial purposes, was studded with Mazdas.

The electric fountain, one of the most interesting and attractive features, was built around the Dewey monument in Union Square, and the discussion as to whether or no the tusks of the four walrus should bend upward or down was immaterial to them, for they were for the nonce in their native element. A large basin of galvanized iron was built around the lower part of the pedestal to contain the water, and around the sides were two rows of Federal sign receptacles, in connection with which it is interesting to note that no other precautions were taken to protect them from the falling water than the use of rubber gaskets. A false cornice built around the top of the pedestal concealed other lamps and the pipes containing the jet nozzles.

One 4-in. pipe formed a circle which contained six hundred 3/32-in. nozzles pointing upwards, and a 3-in. pipe fitted square to conform to the pedestal of the monument, allowed water to fall from several hundred holes with which it was pierced. The main pipe was of 6-in. diameter, fed from a centrifugal pump driven by a 40 h.p. 220 volt, d.c. motor. The pump, motor and outside of the basin were hidden with foliage. For the lighting of the fountain 40-watt Mazdas were used, which had been dipped, purple, blue, green, and amber, and an equal number of clear, making 420 lamps all told. These were arranged on a Federal flasher, giving twelve different color schemes per minute, and these were reflected on the water with exceedingly pretty effect. The total number of lamps in Union Square was 1500, not including the fountain.

In the installation of the special electrical lighting ordered by the Portola Festival committee, 55,000

ft. of weatherproof wire from No. 10 to 4-0 120,000 ft. No. 14 weatherproof, 40,000 ft. No. 10 duplex and 20,000 ft. rubber-covered wire, a total length of over 40 miles of insulated wire, were used.

Many buildings were outlined with electric lights, for this system has seemingly lost none of its popularity or attractiveness, notwithstanding the revolution in this class of lighting promised by the advent of the use of projected light at the Panama-Pacific Exposition. Among the many buildings so outlined were the Palace Hotel, Hale Bros., Herbert's Bachelors' Hotel, White House, St. Francis Hotel, I. Magnin & Co., Roos Bros. and the temporary City Hall.

The fleet of warships anchored in the bay contributed their share to the feast of lights as only American warships can, although at times the fog caused a little disappointment to those trying to view this spectacle from the shore. Probably that is why a fleet of ships came on land, although there is a further probability that the committee arranged this as a tribute to the valorous Vasco Nunez de Balboa, who was made Admiral by the King of Spain because of the successful issue to his land expedition which resulted in the discovery of the Pacific, for at this festival Gasper de Portola, who discovered San Francisco Bay in 1769,—also after a land expedition,—was almost eclipsed by the commemoration of the discovery of the Pacific by Balboa in 1513, and it was Portola's festival for awhile, only in name.

The fleet of eighteen ships which came to land were built around flat trolley cars, thus permitting an abundant use of light and making possible a climax to the festival which excelled anything of this kind heretofore seen in San Francisco. Each boat was studded and hung with vari-colored jewels of incandescent lights from stem to stern. The ships represented the Greek Trireme, which had also a very pretty effect of delicately colored lanterns embodied into the design of the craft, and Spanish rather in appearance, a Viking Galley, Chinese Junk, Columbus Ship, the Santa Maria, Sir Thomas Drake's ship and an English man-of-war, 18th century, a Portuguese sailing vessel, Indian Canoe, old fashioned side-wheeler Cristoba, a model of the Savannah, the first steamship to cross the Atlantic in 1842, a stern-wheeler, two American man-of-war vessels, the Constitution (1812) and the Monitor (1860), other warships and then the Queen of Pageantry float. An estimate made of the rated candle-power of the lamps used in the electrical parade was very conservatively placed at 100,000, and the whole electrical effect proved an enchantment which the revelers pronounced the most artistic, interesting and exhilarating ever witnessed in San Francisco.

Ferry Tower.

Don Gaspar de Portola and Vasco Nunez de Balboa represented the Spirit of Discovery, and it is fitting that this most successful celebration of their achievements should have been literally expressed through the greatest discoveries of this electrical age.

CANALIZATION OF THE COLUMBIA AND SNAKE RIVERS.

BY JOHN H. LEWIS, State Engineer, Oregon.

[Writing of proposed and desirable developments in northwestern states, the author, among other matters of interest, directs attention to the practicability of cheap hydroelectric power development, incidental to the interlinking of a system of navigable streams and its great possibilities in the building up of industries. The paper, which is abstracted, was presented at the Convention of the Columbia Snake River Waterway Association, 1913.—The Editor.]

Now that there is prospect for the early completion of a 40 foot channel across the Columbia River bar, it is important that definite plans be made for connecting up the various links in the 200 miles of navigable waters tributary to this outlet. The time appears ripe for a concerted movement for the improvement of navigation facilities for the benefit of every section of the 254,000 square miles of territory tributary to the Columbia River bar.

Any plan of development should take into account the use of water for navigation, irrigation, power development and other purposes. We have an unusual problem, which must be solved in an unusual way. The unusual feature is the enormous quantities of water power which can be developed incidental to navigation. The problem therefore is to find new uses for this unused power.

The development of this vast empire seems to me to be progressing backward in the most discouraging manner to the farmer on whom we are dependent for its final accomplishment. The first step in a program for National irrigation should have been to provide a national system of water or rail transportation for the marketing of products raised on the vast irrigation projects.

What transportation means to the farmer can be expressed briefly by the following figures, which are approximately correct: $1.00 will pay for carrying 1 ton 15 miles on an efficient wagon road, 150 to 300 miles on an efficient railroad, 1500 miles on inland deep waterways, and 2000 to 3000 miles on the ocean. His market radius will be extended by inland waterways five times farther than if dependent on railroads alone, and about ten times farther if accessible to the ocean.

Why is it necessary to await appropriations by Congress when we have an enormous reservoir of credit in the two billion dollars of assessed valuation of these three states? If cities have learned to loan the credit of all the people to furnish economical street pavements, water supplies, and electric light systems, why should not the people of the great Columbia basin loan their credit to provide economical water highways for the speedy and economical development of this region? If the various states could co-operate, each with the other, and with the United States, the problem would be simple.

I believe it safe to say that there is more undeveloped water power within economical transmission distance of the city of Portland, than within a like distance of any other city in the world of its size, similarly situated on tide water. If The Dalles water power project, now under investigation by the state of Oregon, can supply thirteen times the power now used by Portland and the surrounding territory, then it is but natural to enquire as to what uses such enormous quantities of power can be put.

The Cyanamid Company of Niagara Falls is now operating six, three-thousand horsepower electric furnaces in the production of a nitrogen amoniate fertilizer, using current at about $15 per h.p. year. The market for the product is said to be increasing faster than men can be educated to carry on the work.

Enormous quantities of electric power will, in the near future, be used in the manufacture of iron and steel, and in the smelting of copper, zinc, and other ores. Iron and steel can be produced in Portland cheaper than in Pittsburgh according to figures furnished by Mr. Potter, former superintendent of the Illinois Steel Company's plant in South Chicago, if electric power at low cost can be had. A high grade iron ore from China can be landed on the Portland docks for 7 cents per unit of iron, in comparison to 8 cents for Lake Superior ore in Chicago. With power at $9 per h.p. year, electric steel rails could be manufactured at $17.50 per ton, where the regular price is about $40. As electric steel rails have been found to be almost unbreakable in service, they are now commanding a premium of from $6 to $10 per ton over open hearth and bessemer rails, according to the same authority. The capital cost of an electric iron and steel plant is about one-third that for a coal using plant. This fact is of great importance to the west. Ore can be obtained from Mexico, Chili, Cuba, or other points if the Chinese supply should prove unavailable.

Pig iron is now being produced by the electric process in Shasta county, California, at about $14 per ton where the same grade at Pittsburgh costs $17.25 per ton. Charcoal equal to one-third the weight of the ore used in the electric furnace, must be had for this industry. As about two cords of fir wood is required for one ton of charcoal, a market can thus be had for our waste wood products. Cheap electrical power can also be used to convert this wood into charcoal. For six years such an electric process plant has been in successful operation at Vancouver, B. C., using waste wood from saw mills.

As a result of experiments by the U. S. Bureau of Mines, it is stated that "there is no reason metallurgically why electric heat may not be substituted for the heat derived from the combustion of carbon in the smelting of copper ores. It depends largely upon the relative cost of coke and electric power. Coke and electricity are about on a par when coke costs $7 a ton and electric energy 0.15 cents per kilowatt hour, or about $10 per h.p. year."

Zinc ores are now being shipped from Australia to Norway for smelting in electric furnaces, and in Tasmania a 200,000 horsepower plant is now under construction for the smelting of the complex ores of that region.

The foregoing statements should be sufficient to convince one that there is a very large market for the employment of cheap electrical power in many new industries which are not now in the field. I will next point out briefly the amount of undeveloped water power available on the Columbia River and Snake River to Huntington, and state what I believe to be the necessary steps to secure its development.

At Cascade Locks, 190,000 water horsepower can be developed at low stage of the river by construction of a 10 ft. dam at the head of the rapids, and a canal in Washington less than 1000 ft. in length. The low water head of 24 ft. will thus be increased to 34 ft. Such a dam will greatly improve navigation conditions between Cascade Locks and Big Eddy. The high water head will be only 14 ft. Sufficient water will, however, be available to maintain the required power output. By removing a number of obstructions to navigation in the stream below, the power possibilities at this point would be somewhat improved.

At Big Eddy 536,000 horsepower can be developed for eight months in the year, which plant will deliver 300,000 continuous electrical horsepower, according to a preliminary report made by the state engineer. The cost is estimated at $77 per h.p. and low tension power can be furnished in the vicinity of the plant at $6.90 per h.p. year.

A dam approximately 180 ft. in height completely closing the present river channel, and a canal 1½ miles in Washington will afford a head of 85 ft. at low water and 32 ft. at extreme high water. Owing to difficulties in turbine design, only a range from 42 to 73 ft. of this head will be needed to give the above results. This will afford ample leeway for construction of the Cascade Locks power project and still leave room for some storage above the upper project to carry peak loads.

This proposed dam, at the head of Five Mile Rapids will place Celilo Falls ten feet under water and drown out 6½ miles of the navigation canal now being constructed by the United States around this obstruction. The lower 1½ miles containing three locks can be used in connection with the power project, the boats entering the wide open river immediately above the dam. This project if constructed, will likewise benefit navigation for many miles up stream. The state of Oregon has appropriated $15,000 for a more detailed investigation at this point, and authorized co-operation with the state of Washington, and with the United States.

With the completion of the Celilo Navigation Canal, the Columbia River will be navigable, with more or less difficulty to Priest Rapids, 198 miles above Celilo. The Snake River is now navigable, with some difficulty from the Columbia to its junction with the Grande Ronde River, a distance of 167 miles. These minor obstructions can easily be overcome by low dams, constructed entirely at the expenes of water power projects. President Roosevelt vetoed a water power grant which if developed would have greatly facilitated navigation to Lewiston, because it was throught such grant did not properly safeguard the peoples rights.

In the 27 miles between Lewiston and the mouth of the Grande Ronde River we have a total fall of 110 ft. or 3.8 ft. per mile. From the Grande Ronde River, to Homestead, which point is four miles below the Ox Bow power project, now under construction, is a distance of 96 miles. The Snake River falls 930 ft. in this distance or 9.7 ft. per mile. It flows through a narrow rock walled canyon not more than 400 ft. in width, as shown by the maps of the army engineers which are available as far as Pittsburg landing, 77 miles above Lewiston. In the 59 miles between Home-

stead and Huntington, there is a fall of 250 ft. or 4.2 ft. to the mile. The banks are not so precipitous in this portion of the river.

In the 182 miles between Lewiston and Huntington, there is thus a total fall of 1290 ft. Much of this can no doubt be utilized for power development, incidental to the improvement of the river for navigation. The balanced piston type of lock, or inclined cable way can be used with little loss of time by boats going over the water power dams.

Ten thousand second feet of water will be available at low stage for the first high dam to be erected just above the junction with Grande Ronde River. This for a 200 foot head would develop 227,000 continuous water horsepower. Assuming bedrock to be found 100 ft. below the water surface, or 90 ft. below the bed of the stream, it is not believed that the dam will cost to exceed $40 per electrical horsepower. Estimating $35 for power house and equipment will bring the total cost to $75, which is a very low figure. Industries located at this site could have both rail and water transportation to the markets of the world.

This dam would create a slack water pool over 20 miles in length and afford water transportation to the next dam above. At such site only 6000 sec. ft. of water will be available which is approximately the amount passing Huntington. In this way it is estimated that 800,000 electrical h.p. could ultimately be developed between Lewiston and Huntington. If any use can be found for this power, a construction charge of $100 per h.p. would be most reasonable. It would thus yield eighty million dollars for construction purposes; making the river navigable at no expense to the people. Ignoring this water power value, there is no hope of ever securing navigation for the upper Snake River Valley in Idaho and Oregon.

It is the duty of these two states, in co-operation with the United States to investigate thoroughly the feasibility of this project before conditions become more complicated through the construction of railway grades near the water surface of the stream.

The first and most important step in my opinion, for the Canalization of the Columbia and Snake Rivers is the creation, by Congress, of a National Water Board, having complete jurisdiction over all interstate and other waters under the jurisdiction of the United States, and which are beyond the control of the state water authorities. Such board should have power to protect the public interest and make definite grants on such terms as may be specified by Congress. The revocable permit and indefinite water power tax imposed by the nation and state should be eliminated, unless it is the plan to undertake all such development at public expense. Pending such legislation, the various states should amend their constitutions, so as to utilize the public credit, if necessary, to secure development.

Each state should erect a demonstration power plant and furnish free power for a number of years, during the experimental stage of the various new industries which may be attracted by such conditions. The electric iron and steel industry was established in Norway by such method. As soon as the industries are on a paying basis, the price of power can be equitably adjusted and the information gained during the operation can be used as a basis for the enactment of more enlightened state and national laws relating to water power. If we establish demonstration farms to promote agricultural development, why is it not just as logical to establish demonstration power plants to encourage industrial development.

In 1914, the people of Oregon will vote upon a constitutional amendment authorizing the issuance of bonds equal to two per cent of the assessed valuation of the state, for the purpose of irrigation and water power development, and for developing the cut over timber lands of the state.

The key to rapid development of the great Columbia River basin, lies in a closer co-operation between the various states, and the nation, and the carrying out of comprehensive plans, in logical order, as the time for each step becomes ripe.

LETTER TO THE EDITOR.

Electrical Threshing in Idaho.

[Pioneering is a pleasure, more particularly when others know that we are the ones who did the pioneering, and it is certainly disappointing to have credit, where there be such, go to another when it rightly belongs to us.

It so often happens "that the makers of better mousetraps," or more important commodities are not known simply because they do not tell it to others, or perhaps, tell it to those who already know, or would readily learn, instead of seeking a wider audience.

The news item published in our October 18 issue, directing attention to the electrical operation, "as far as is known," of the first threshing machines in Idaho is supplemented by the letter received from the Idaho-Oregon Light & Power Company, which we are more than pleased to publish in order that the credit be more nearly located and more accurate information given to our raaders.

The letter which Mr. Orr, the district manager of the company, has been kind enough to forward to us is indeed appreciated, and will, we hope, serve to encourage others to correspond with the editorial department regarding anything published in our columns regarding which they may have a different viewpoint.

Friendly discussion is of greater service to the general public in the dissemination of knowledge than the most profound lecture.

Probably your own outlook and ours may be enlarged by such action, which might certainly prove on some matters of great value to other readers.—The Editor.]

Dear Sir: Beg to advise that I note in your issue of October 18th that you mention that the "first threshing machine operated by electric power in Idaho was installed in Hagerman Valley this season."

First Electrically-Operated Threshing Machine—Idaho.

Wish to advise that I am enclosing a picture of a threshing machine that has been operated by electricity for the past two years on the Florence Bell Land Company's ranch, near Payette. We have two such installations in use near here at the present time. Both are Case threshing machines, operated by Westinghouse motors. Power for these is supplied by the Idaho-Oregon Light & Power Company.

Yours very truly,

IDAHO-OREGON LIGHT & POWER CO.,

By J. F. Orr, District Manager.

ELECTRICAL PUMPING AND IRRIGATION

THE SELECTION AND INSTALLATION OF A SMALL PUMPING PLANT.

BY B. A. ETCHEVERRY.

[Continued.]

Final Selection of Type of Plant.

The final selection of a pumping plant should be based on a careful consideration of the factors stated above. The best size of plant, the period of operation, the kind of engine or driving power, can only be correctly determined by a final consideration of the cost of installation and cost of operation. Where electric power is available, the choice is between a steam engine, a gasoline engine and an electric motor. The electric motor requires minimum attendance. It is reliable and its first cost is much less than that of a gasoline or steam engine. For these reasons if electric power is available, an electric motor is preferable and will prove far more economical even should the cost of electrical energy be higher than the fuel cost for a gasoline or steam engine.

The application of the above information and cost data to any particular case is illustrated by the following examples:

A 20 acre orchard is to be irrigated by pumping from a surface body of water requiring no wells. The quantity to be applied is 6 in. per month, and the total depth in one season, 18 in. The lift is 50 ft. and the discharge pipe 200 ft. long. Engine gasoline or distillate costs 12 cents per gallon. Assuming the pump is operated 1/3 of the time or ten twenty-four-hour days each month, this will require a pump capacity of 225 gallons per minute, which is obtained with a No. 3 centrifugal pump and 7 h.p. engine, as shown in previous tables. The discharge pipe will be 4 in. in wil be about as follows:

First Cost of Plant.

No. 3 centrifugal pump	$ 57
7 h.p. gasoline engine	450
Priming pump, suction pipe, fittings, etc	50
Freight charges and hauling	30
Wood-banded discharge pipe, 200 feet of 4 inch	40
Installation, 5% of cost	35
Building to house plant	40
Total cost	$702

Total Annual Cost of Operation.

Fuel cost of 7 brake h.p. engine for 3 periods of 10 days each or 720 hours (page —) $= 720 \times 7 \times 2.00 = 10{,}000$	$100
Fixed charges at 17% of first cost	120
Attendance 720 hours at 10 cents	72
Total cost for 20 acres	$292
Cost per acre, $15.	

Where electric power is obtainable, the first cost of plant and annual cost of operation for the same conditions, assuming the unit cost of electric power to be 3 cents per kilowatt hour, would be:

First cost of plant	$375
Total cost of operation (annual)	215
Cost of operation per acre	11

Tabulated below are the first costs of gasoline engine pumping plants and the costs of operation for orchards of 20, 40 and 80 acres for lifts of 50 ft., and 150 ft. and for different periods of operation. For the higher lifts single acting triplex pumps are used. The costs given are based on gasoline at 12 cents per gallon, for a depth of irrigation of 18 in. for the lower lift and depths of 18 in. and 12 in. for the higher lift, it being assumed that by careful use of water, if the soil is retentive, 12 in. may be sufficient. The discharge pipe is assumed to be 200 ft. long.

Cost of Pumping with Gasoline Engines and Centrifugal Pumps for 50 Ft. Lift.

Gasoline, 12 Cents per Gallon.

Area in acres.	No. of days pump is operated per month.	Capacity 24-hour of pump. Gal. per min.	No. of pump.	Horse-power of engine.	First cost of installation.	Annual cost of operating per acre; 18 in. depth of water applied. Fuel.	Fixed charges.	Attendance.	Total.
20	5½	400	4	12	$970	$4.80	$8.25	$1.90	$14.95
	10	225	3	7	700	5.10	6.00	3.60	14.70
	20	113	2	5	590	7.00	5.00	7.20	19.20
40	5	900	6	25	1575	4.50	6.70	.90	12.10
	11	400	4	12	970	4.80	4.10	2.00	10.90
	20	225	3	7	700	5.10	3.00	3.60	11.70
80	10	900	6	25	1575	4.50	3.35	.90	8.85
	22	400	4	12	970	4.80	2.05	2.00	8.85

Cost of Pumping with Gasoline Engines and Single-Acting Triplex Pumps for 150 Ft. Lift.

Area in acres.	No. of days pump is operated per month.	Capacity 24-hour of pump. Gal. per min.	Horse-power of engine.	First cost of installation.	Annual cost of operation per acre for a depth of irrigation water of: 18 in. Fuel.	Fixed charges.	Attendance.	Total.	12 in. Total.
20	8 1/3	270	15	$1850	$9.90	$15.75	$3.00	$28.65	$24.35
	12 1/2	180	10	1375	9.90	11.70	4.50	26.10	21.30
	25	90	6	1025	10.90	8.70	9.00	28.60	22.00
40	13 1/4	340	18	2200	8.70	9.35	2.40	20.45	16.75
	16 2/3	270	15	1850	9.90	7.90	3.00	20.80	16.50
	25	180	10	1375	9.90	5.85	4.50	20.25	15.45
80	26 1/2	340	18	2200	8.70	4.70	2.40	15.80	12.10

The capacities of pumps, especially plunger pumps, and the sizes of engines vary with the different makes, and for that reason the sizes given are not always obtainable, but sizes approximating these can be used in place.

The above cost estimates are only approximate. They are based on the conditions stated above and are not applicable to all cases because of the varying conditions which make the installation of nearly every pumping plant a special problem. The estimates are made for gasoline engines and are considerably higher than for electric motors. The first example showed that with an electric plant the cost of pumping was only 73 per cent of the cost with a gasoline plant. The tabulated values show the following interesting results:

1st. The cost per acre of pumping is much larger for a small area than for a large area.

2d. The cost per acre does not vary considerably with the period of operation, and in some cases a plant moderately large operating for a shorter period will cost less per acre than a smaller plant operating a longer period. This is due to the lower fuel cost with the larger and more efficient plant and the decreased cost of attendance for the shorter period of operation which overbalance the larger fixed charges. Even should the resulting cost be smaller for the smaller plant, the inconvenience due to pumping for a long period and the extra labor in irrigation may overbalance the saving in cost.

3d. For the lifts assumed a period of operation equal to about ten twenty-four hour days during the

month or one-third of the time during the irrigation season seems to be preferable with the centrifugal pump. With the higher price triplex plunger pumps a period of operation of one-third to two-thirds of the time is preferable.

Co-operative Pumping.

The lower cost per acre for larger areas shows the advantage to be gained by co-operation between small owners. By uniting and installing a large plant instead of several smaller plants, the cost of installation and operation is very much reduced, and the plant can be given more competent attention, which relieves the orchardist and increases the life of the plant. Where by such co-operation several hundred acres can be brought together, a central steam plant to generate electric power, which is transmitted to the several electric motor pumping plants, is the most economical and best solution.

For separate plants above 20 or 40 h.p., gas producer plants connected to gas engines will furnish the cheapest power. These plants are reliable and easily operated. They consist of the producer in which hard coal is placed and through a process of partial combustion, in the presence of air and steam, forms the gas which operates the engine. Gas producers operated on hard or anthracite coal have been in successful operation for a number of years, and those operated on soft or bituminous coal and on oil are coming into use, but are still in the experimental stage. The fuel consumption is very low, usually from 1 to 1½ lb. of coal or 1/6 to 1/7 of a gallon of crude oil per horsepower hour; or ½ to ¾ of a cent per horsepower hour with hard coal at $10 per ton and about 1/3 of a cent with oil at 2 cents per gallon. This is from 2½ to 6 times less than the fuel cost with gasoline at 12 cents a gallon. Producer gas plants are more expensive than gasoline engines and for smaller plants the fuel economy will be overbalanced by the larger interest and depreciation charges. For very large single plants, high duty steam engines will be the most economical form of installation.

Limits of Economical Pumping.

The cases previously worked out for gasoline engine pumping plants show that for small tracts of 20 to 80 acres the cost of lifting sufficient water to give a depth of irrigation water of 18 in. will range for a lift of 50 ft. from about $8.85 per acre for the larger area to about $15 per acre or the smaller area, and for lifts of 150 ft., the respective costs are about $15 and $25 per acre. These costs may seem high as compared with gravity water, but to obtain an idea of the economy and feasibility of developing water by pumping, comparisons must be made with the value of gravity irrigation water in the same conditions. Except in southern California, up to a few years ago gravity water obtainable without pumping has been available. For that reason pumping has not been necessary, and comparatively few pumping plants have been constructed. However, water is becoming more valuable and the steps which many irrigation companies are taking to conserve water and prevent losses of transportation by carrying the water in concrete lined canals and in pipes constructed at considerable expense, show that in some localities at least, water has become sufficiently valuable to justify pumping. If a comparison is made with water thus obtained, we find that the cost of construction of a well constructed system may go up to $50 or $60 per acre and even higher. This cost is charged up to the land which is sold to the orchardist and in addition reasonable profit is made on the value of the land. It is probably conservative to assume that land under an irrigation system in localities well developed and where irrigation is necessary, will cost at least $100 per acre more than similar land for which there is no gravity supply. The chief advantage of gravity systems is the low annual cost of operation, usually less than $2 or $3 per acre, although in some cases it may be as much as $5 per acre or more, but if to this be added the interest on the difference in cost between land under the irrigation system and land which is to be supplied by pumping, assumed at $100, the total annual cost may be $10 to $15 per acre. This is about equal to the cost of pumping with gasoline engines to a height of 50 ft. and about half as large as for lifts of 150 ft. Where electric power is available or for large pumping plants the cost of pumping would compare very favorably with gravity water, even for higher lifts than those stated above.

Some of the advantages of underground pumped water as compared to water obtained from a gravity irrigation system are:

1st. An underground supply is more reliable and is not likely to be deficient before the end of the irrigation season.

2d. The irrigator is independent and controls his own water supply, and is prepared to irrigate his crops at the best time.

3d. The underground water is free from the seeds of weeds.

A consideration of pumping in some of the well developed irrigated districts is of interest to show its feasibility. In eastern Washington water is being pumped in one case to an elevation of 250 ft. above the source of supply. In the citrus district of southern California lifts above 200 ft. are not unusual, and it is considered profitable to pump 460 ft. In the Pomona district of southern California the cost of pumped water averages $15 per acre for one acre foot when purchased from irrigation companies, while for smaller private plants the cost is often greater. In 1905 the Irrigation Investigations Office of the United States Department of Agriculture made tests on various pumping plants and these show that the cost of pumping at private plants of 10 to 100 h.p. with lifts of 100 to 300 ft., varied from $10 to $90 per acre for one acre foot of water.

There is a limit beyond which it is not economically feasible to pump. In the California citrus districts lifts above 400 ft. have been considered profitable. For the orchard lands of the Northwest equally high lifts should be profitable, for the net return per acre from a good apple orchard is usually more than that from a citrus orchard. A citrus orchard 10 years old should average a net profit of $100 to $150 per acre. The net profits from apple orchards 10 to 12 years old in the Yakima Valley are given in bulle-

tins of the United States Department of Agriculture as $200 to $600 per acre. With profits larger than those obtained from citrus orchards in southern California, what has been considered feasible in pumping there, is at least equally so for apple orchards or other valuable crops when no other more economical source of water supply is available. However, for small pumping plants and small areas it is well not to exceed 200 ft., while for larger plants lifts of 400 ft. may be economically feasible.

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Motor Busses in London.—The London General Omnibus Company now has 2500 motor busses in and around London and others are being rapidly built at the company's factory. There are over 30 garages for these cars. A standard motor bus has been designed, as the company assumes that the experimental period has passed. Originally the company bought its busses abroad, but now their own factory can produce all the vehicles that are likely to be required. The modern motor bus is of 35 h.p. and its chief improvement is in quietude of running—indeed, this advantage is being questioned as a danger, because there is so little noise to herald the approach of the machines. The company trains its own drivers, finding the most suitable recruits from men who have driven heavy vehicles. Every motor bus is removed from the streets once every 10 days to be thoroughly overhauled. The company has its own inspectors to watch the drivers and to warn those who may show signs of negligence.

A Chinese street railway in the native city of Shanghai was inaugurated on August 16, 1913. It is two and one-half miles in length and is the first electrical street railway in any Chinese city (as contrasted with foreign settlements). The work was done entirely by Chinese, with Chinese capital.

Fuel oil consumption this year by the United States Navy is estimated at 30 million gallons.

A GAS COMPANY'S PUBLIC POLICY.

BY LESTER A. WRIGHT, Chemist, San Diego Con. Gas & Electric Company.

(Gas companies as public servants are subject to considerable abuse and the author points out that their public policy should be such that the customers realize just what is being done to ensure satisfactory service and so eliminate this as far as possible. Attention is directed to the principles which should stimulate the activities of each department to achieve this end. The paper was presented before the Pacific Coast Gas Association convention, 1913.—The Editor.)

In the not very remote past it was the policy of public service corporations to regard the public in the light that the less they knew the better. The ignorant public, however, was a very suspicious one and suspicion leads often to unfriendliness.

It is a peculiar thing about the people of the United States, men in all walks of life, of all occupations and all degrees of education, all have a warped idea of public officials as soon as they cease being private citizens and chiefly because they do not know the facts and will not trouble themselves to learn them.

It has always puzzled me, (that is ever since my father became a public official) why men who enjoy respect as private citizens, immediately upon election to office become objects of abuse and contempt, and I have wondered how these public officials can withstand the withering fire of these indignities and how they discover the fortitude to proceed with their duties in the face of the accusations of malice and ignorance.

It is with this selfsame public that the gas company has to deal and in the same position as these other public servants. But treating them as has been done in the past only makes matters worse and the managers of the present have awakened to the desirability of friendly relations between their companies and the public. "Public Policy"—there have been loads of articles, advice and preaching on this subject and it would seem that the extraordinary quantity of good counsel must long ago have had its effect, the reforms adopted and an era of peace and good will begun. Unfortunately the new policy has not come about as swiftly as the logic of the situation would bid.

Being a member of one of the Byllesby companies and knowing that these companies stand on terms of exceptional friendliness with the public in the communities they serve, Mr. Bostwick, our secretary, asked me to outline the public policy of the Byllesby organization in this paper. In methods of minor detail and daily practice, it is impracticable to have a uniform method, due to local conditions. There are, however, fundamental principles applying to the conduct of public utilities which have application in any locality. To quote one of the Byllesby officials "Public utilities exist for the purpose of contact with the public. In modern town life they enter into the lives of nearly every individual every day out of the three hundred and sixty-five. Their work is a series of constant contacts with the public."

The public's idea of a gas company has been and still is in many cases, that of an octopus whose tenacles stretch out in every conceivable direction and do nothing but bully and rob the common people.

Public utilities in reality are the most democratic of commercial institutions. They serve people of all classes in the human scale, with more uniformity in price and quality than any other business. Gas s supplied the negro washwoman, the grocery man's wife, the banker's and the millionaire's wife of the same heating value and at the same price.

A few of the Byllesby maxims are, "Deal fairly with the public in all things relating to the company's activities." "Take every precaution to treat the public in a courteous and respectful manner." "Enter into every activity for community advancement with a will and furnish financial assistance in big public undertakings whenever practicable." "The employe who serves our company best, is the employe who serves the public best."

A man's pride is his vulnerable point, his "Achilles heel" as it were; he can stand poor service, poor pressure, pipes stopped up with naphthaline, etc., to some extent if his pride has not been stepped on. But if it has, he often imagines less than an inch pressure when in reality there is five. A discourteous retort, an impertinent clerk, a tactless collector, will often times make him so angry with a company that all its good service will not appease him. The employes of a gas company are paid to be courteous, they are serving the public. It is the people's money that is paying their salaries. A pleasant and tactful employe is worth more to a gas company than two or three adding machines or their human counterpart.

Some time or another a company is going to come before the council or the public, asking for franchises or maybe fighting for its very life, in which case it is far better to have a friend in the public than a suspicious and doubtin one, as facts, figures and logic are seldom of avail against the inflamed mind of the public.

A gas company cannot be too careful of the mental caliber of its employes and their consideration for the public especially when things are rushing and the employe is in a nervous, hurried state of mind. The saying "A soft answer turneth away wrath" is a very true one and many a friend is made for a company or turned into a perpetual enemy by the answer given to him when he comes in, angry to kick about too high a bill or something of the kind. The Byllesby people have made it plain that they do not expect their employes to assume a grovelling attitude nor to appear to scrape favor at the expense of self respect, as there is neither necessity nor occasion for seeking the influence of individuals by fawning and flattery.

I am going to run through the various departments of a gas company under the Byllesby regime trying to show their principles:

The Manager.—The manager of a company, its highest official, is all important in the matter of friendly public relations; he is called upon in regard to many matters outside of company business, concerning the welfare of the community. He mixes with the leaders of thought and action, he belongs to the business clubs, the country clubs and must mingle in the best society. His personality stands in a large measure for the personality of the company. He must conduct his office the same as a public official, have his door always open to whoever thinks he must see him and big or little, give him his undivided attenton. Like any public servant, senator or assemblyman, he has a varied constituency and the more he comes in personal contact with it, the better able he is to obtain its confidence and a sympathetic point of view. A broad acquaintance is of great value to him and a good memory for faces and names is a gift to be cultivated with great care.

The Superintendent.—The superintendent, while keeping in touch with operation, construction and technical matters, is often called upon to take the manager's place in his absence and the same qualifications are necessary for a man in his office, a good mixer as well as a technical man.

The Complaint Department.—The Byllesby organization includes a complaint department which handles all disputes and complaints. A separate room is provided with pressure gauges, jet photometers, glass enclosed meters, etc., with a competent man in charge. The man in charge of this department, must not be hasty in his conclusions; to deal successfully with the people who come to his office with grievances, seemingly irreconcilable, he must have a good insight into human nature.

Look in the dictionary and find the definitions of complaint; some of them are:

"An expression of grief."
"A finding fault."
"A disease."

With a few people, the making of complaints has developed into a disease. But in the majority of cases, the consumer really thinks or knows something is wrong and is not making complaint simply for the purpose of finding fault, hence the importance of having a complaint man who is diplomatic enough to look at the complaint from the consumers' standpoint and apply the remedy or explanation needed.

The same complaint from the same location a great many times hay lead the complaint man to believe the complainant has the chronic disease of complaining. But as a rule this is not the case. Some real reason exists; the fault lies with the trouble men. Now the complaint must be remedied eventually, why not on the first visit? In San Diego the trouble man is supposed to put on the tag attached to the meter, the trouble, date and his initials. After three visits the meter is brought in.

Every employe of a company should be a trouble man and every official should make it his duty in case of trouble near him, to get there and give the remedying of it his personal supervision. The fact that an official of the company is there no matter whether he knows if the trouble be poor gas or a stoppage, appeals to the complainant's pride so that he feels the company is doing all in its power. There is nothing, gentlemen, like a little attention from an official to remedy troubles; a consumer may only have gas of 450 B.t.u. still if an official of the company gives him a good reason for the trouble and explains that everything that can be done will be done to remedy the matter, tells him that he will see to it personally, the gas almost immediately looks better to the consumer. The thing to do is to be honest with the public and they will appreciate it and in times of emergency, help you out by taking the necessary poor service in good part.

Collection Department.—The collectors, meter readers and trouble men come in contact with the consumers continuously and a little pains on their part will make many friends for the company. If when the trouble man blows out the service pipe he will ask the housewife if there is any other service he can render, such as adjusting her stove, etc., she will appreciate it and regard the company in a more friendly light.

The Accounting Department.—A crowded office always causes a considerable amount of confusion and confusion causes overworked and nervous clerks, short answers and disgruntled customers. It is the policy of the Byllesby organization to provide large offices and plenty of clerks to equalize the work by regulating the meter readings so that bills come due on different days in the month and thus save confusion. This relieves the strain upon the office force which usually falls on it around the first of the month and promotes more accurate work.

The Advertising Department.—A greater part of the public sees the company's advertisement every day than comes to the office or speaks to an employe once a month, and this advertising is accepted as expressing the spirit of the organization to a considerable extent. Therefore it behooves a company to take great pains with its advertising, not to advertise too much nor too etensively, as consumers will say that you are buying such and such a paper with your advertising or that the money you put in advertising had much better be put in giving better service, etc. Still there can be a certain tone in the advertising given out indicative of the company's policy, how it regards its customers, etc.

The New Business Department.—The new business department is in constant touch with the public. They (the salesmen) are out after business and through their dealings with the public are in a better position to know what the people are thinking about, what they want in the way of service and how they look at matters relating to the company, than any other department. It should therefore co-

operate with the other departments to keep them posted as to public feeling. A few salesmen do not take the trouble to stand up for the operating department, to appreciate that it has its troubles as well as the others, nor do they stop in their effort to make a sale to satisfy some customer concerning an apt to be imaginary complaint. But a great many do and in lots of instances the new business men have been extremely valuable in overcoming prejudice and hostility.

Rates.—Now as to rates, the Byllesby people charge the manager of their property as much for gas as any citizen, every employee must have a meter and pay the same as his next door neighbor. I heard my father one winter remark to my mother, when she was indignant over the largeness of her gas bill, that Mrs. So and So, the manager's wife, was complaining about her large bills too, which immediately made my mother feel better satisfied.

As I have said before, entering into muncipal improvements, with both vocal and financial support, helps win for a company the confidence of the public. In San Diego this last summer it was found that the town had grown beyond the expectations of the city water department and that the big supply main was not big enough to keep all parts of the city in water, the warm weather coming on. They couldn't buy pipe and get it on the ground inside of a month or so. The gas company stepped in and not only loaned the city pipe which it had already laid out for a main extension of its own, but loaned the city its employes to help lay it, thus gaining the good will of the city officials and praise from the people.

Until a gas company operates on this hypothesis, that every customer may take his business away from the company if he chooses, they will not get the support of the public. It is immaterial to a gas company how ordinary mercantile institutions treat their customers. They themselves, because they operate monopolies, must treat their customers better than competitive business institutions and must make the public aware of that fact to gain the public confidence and fulfill to the fullest extent the purpose of their life.

No one doubts the beneficent results that eventually followed the great civil war of the United States. No one doubts the loss of life and money and no one, at least of the preceding generation, forgets the pain and anguish and bitterness of that struggle. The public service corporations in the past have made no greater errors of judgment or management, nor have they made greater departures from the correct rules of conduct than have the individuals, communities and governments with whom they have dealings. And so with the assistance and good will of the public, the utility companies of the present will do all in their power to serve the people faithfully and well. The more honest a corporation is with the public, the better success it will have in the long run. To quote a few lines in closing: "Life is a matter of mutual exchange. The man who gives nothing, gets nothing; the attempt to get something for nothing is equally futile in business, in society and in friendship; legitimate trade is merely a matter of exchange for mutual benefit.

It is this giving and taking—this recognition of our mutual need—that has held the world together, and the one who fails to understand this fundamental human relation has missed the meaning of life."

The Isthmian Canal Commission statement of classified expenditures shows that $2,928,208.83 was expended by the department of construction and engineering during the month of June, 1913. For the six months ending June 30, 1913, this department expended $17,777,602. The total expenditures of the commission to that date being $298,985,812.90.

CENSUS REPORT ON ELECTRICAL MACHINERY.

Statistics of the electrical machinery, apparatus, and supplies industry in the United States for 1909 are presented in detail in a bulletin soon to be issued by Director Harris of the Bureau of the Census, Department of Commerce. It was prepared under the supervision of W. M. Steuart, Chief Statistician for Manufactures.

This industry includes the manufacture of the machines and appliances used in the generation, transmission and utilization of electric energy, together with most of the parts, accessories and supplies for them. It does not include, however, the production of poles, whether of wood, iron or steel; nor does it include the manufacture of glass and porcelain ware made expressly for electrical purposes, that of bare iron and copper wire, or any of the group of electrochemical and electrometallurgical products.

The total number of establishments in the United States in 1909 engaged in the manufacture of electrical machinery, apparatus and supplies was 1009. The total number of persons engaged in the industry was 105,600, of whom 102,950 were wage-earners. The total capital employed was $267,844,432, and the total value of products was $221,308,563.

The industry in 1909 was largely centralized in the six states of New York, Pennsylvania, New Jersey, Massachusetts, Illinois and Ohio. These states, together, reported 83.9 per cent of the total average number of wage earners, 82.6 per cent of the total value of products, and 83.1 per cent of the total value added by manufacture.

New York was the leading state in the industry, ranking first at the censuses of 1909 and 1904. During 1909 this state produced electrical machinery, apparatus and supplies to the value of $49,289,815, or more than one-fifth of the total for the United States. The number of wage-earners employed in the state increased 83 per cent during the decade ending with 1909, while the value of products and the value added by manufacture more than doubled.

Pennsylvania ranked second among the states in 1909 and 1904 in value of products and in value added by manufacture, though in the average number of wage-earners employed it dropped from second place in 1904 to fourth place in 1909. In 1909 New Jersey, which showed the most rapid development of any of the six leading states in the industry, ranked third in number of wage earners employed and value of products, advancing from fourth place in number of wage-earners and from fifth place in value of products during the preceding five years. Michigan, which occupies a position of minor importance among the states in the industry, shows the largest percentages of increase in all three items, while Connecticut, Indiana and Wisconsin also show large relative gains.

Establishments owned by corporations constituted more than two-thirds of the total number of estabments reported, and the value of their products represented 96.3 per cent of the total value in 1909 and 95 per cent in 1904. In 1909, 1692 wage-earners, or 1.9 per cent of the total, were employed in establishments under individual ownership; 1167, or 1.3 per cent, in

those under firm ownership; and 84,397, or 96.7 per cent, in those owned by corporations.

Of the 1009 establishments reported for 1909, 31 manufactured products valued $1,000,000 or over. In 1904 there were 22 establishments of this class out of a total of 784. While such establishments represented but a comparatively small proportion of the total number at both censuses, they reported 57.1 per cent of the total value of products in 1909, and 60.5 per cent in 1904. The average value of products per establishment increased from $179,604 in 1904 to $219,335 in 1909, and the average value added by manufacture, from $94,353 to $111,737. The average number of wage-earners per establishment increased from 77 in 1904 to 86 in 1909.

Value of Products.

In 1909 there were 16,791 dynamos of all kinds manufactured of a total value of $13,081,048. Of these, 13,882 were of direct current, and 2909 of alternating current. During the decade ending with 1909 there was an increase of 59.5 per cent in the number and of 143.2 per cent in the total capacity, of dynamos produced. The average capacity per machine increased from 55 kw. in 1899 to 84 kw. in 1909.

There were 76,729 transformers manufactured of a total value of $8,801,019.

The production of switchboards in 1909 was valued at $5,971,804.

Some 504,030 motors of a total of 2,733,418 h.p. and a value of $32,087,482 were manufactured in 1909.

The number, capacity, and value of motors for transforming electric current into mechanical power were very much larger in 1909 than in 1899. The number of motors of all kinds produced increased 215.5 per cent during the decade, their capacity 123.8 per cent, and their value, 64.5 per cent. The largest increases are shown in the case of the motors for operating stationary machinery. The general report on manufactures shows a large increase in the use of electric power. In 1909 there were 388,854 electric motors with a capacity of 4,817,140 h.p. installed in manufacturing establishments. In 1899 there were only 16,891 motors reported with a capacity of 492,936 h.p.

The number of primary batteries manufactured in 1909 was 34,333,531 valued at $5,312,595; an increase in value of 498.7 per cent since 1899. The production of batteries was valued at $4,243,984 for 1909, an increase of 65.8 per cent during the decade.

The value of arc lamps manufactured in 1909 was $1,706,959, and the number 123,985. From 1899 to 1909 there was a decrease of 34,202, or 21.6 per cent in the number of arc lamps manufactured and a decrease of $120,812 or 6.6 per cent in their total value. The decrease is accounted for by the fact that, while formerly arc lamps were used almost exclusively for street lighting and other purposes, the incandescent lamps have now replaced them to an appreciable extent.

The production of incandescent lamps showed a valuation of $15,714,809 for 1909 and a total number of 66,776,997. About one-fifth of this total production was tungsten, the remainder being classified as carbon filament.

The value of insulated wire and cables manufactured in 1909, 1904 and 1899 constituted the largest single item in the total value of electrical machinery, apparatus, and supplies reported, representing more than one-fifth of the total value of products for the industry at each census. Of the $51,624,737 reported as the total value of insulated wire and cables, $40,250,572 was reported by establishments in the industry proper, and $11,374,165 by establishments engaged primarily in other industries. Only a small number of the establishments in the industry proper drew the wire which they insulated, while of the establishments outside the industry reporting this product the greater number were engaged primarily in wire drawing. New Jersey, Illinois and New York were the three states leading in this branch of the industry in 1909, reporting 63.8 per cent of the total value in that year and 66.1 per cent 1904.

PANAMA-PACIFIC EXPOSITION ELECTRICAL DISTRIBUTION SYSTEM.

The capacity of the conductors is sufficient to provide for dark days when ground lighting would be needed before the closing down of the motor load. On this account the exposition peak has been taken as follows:

Luminous arcs	500 kw.
Exhibit palaces, buildings, etc	5,000 kw.
Foreign nations, states and U. S. Government	2,500 kw.
Concessions	2,500 kw.
Direct current motors	1,000 kw.
Peak load	11,500 kw.

Except for an overhead system in rear of the concessions district, and another in the extreme western part of the grounds in the vicinity of the race track, the distribution system will be underground.

The overhead systems are of the standard pole line construction. The underground system is based upon the use of wood fibre duct and manholes of wood construction. The box or trough construction will extend between manholes and will vary in size to suit the number of ducts to be provided. The space between the duct and the wood trough is to be filled with sand, except at the entrance of the manholes, where four lineal feet of concrete will be used. This particular type of underground conduit was adopted because of its mechanical strength and economy. The short life of the exposition required an economical design throughout. The average cost of installation is, approximately 10 cents per duct ft. with the wood manholes of the shallow type averaging $25 each and the deep section type averaging $50. No subway type transformers will be used, as all transformers will be placed in the main exhibit palaces. Vaults for the transformers will be required in a number of the states' and foreign nations' buildings.

All electric energy will be distributed throughout the grounds at a primary voltage of 4000 a.c., with secondary voltages as stated in a previous issue. All energy will be purchased by the exposition company from one of the local power companies, which will construct a central station on the exposition grounds. Present indications are that while the exposition voltage is 4000, the generating voltage will probably be 11,000 stepped down to the exposition primary voltage. In the event of this special station being disabled in any way, power will be drawn from other sources of the power company.

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Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advrtisers should mail copy at least thirty days in advance of date of issue.

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Illuminating Engineering Society

There seems to be no end to the number of engineering societies to which one might belong and where at one time it was a pleasure to boast membership in practically all of them, the individual now closely analyses the derivable benefits before signing the membership blank. In the final analysis, membership in some societies is indispensable, while in others, the benefits to each member are difficult to trace.

In all it is true, too, that mere membership will not benefit. It is possible to benefit only by active participation in the work of each society or at least by perhaps selfishly using the knowledge which the research of each society establishes.

It might be pointed out that membership in a Botanical Society could be made to contribute towards increased business for the manufacturers of say Iluminating Glassware, or Reflectors, if the proceedings of the society were carefully followed. "Certain illuminants used in greenhouses are injurious to the plants," and at once the manufacturer commences to develop this market with a special line of reflectors for electric lighting of greenhouses, and a new outlet has been found for electrical goods, bringing business, as is usual, to every other branch of the industry as well.

Although the derivable benefits are not quite so far-fetched, it often seems possible to get along without certain memberships, but there are others which so contribute to the advancement of the industry as a whole, that membership just happens as a matter of course.

In this latter class is the Illuminating Engineering Society which, strange to say, has had no representaton, other than that of individual membership, in the whole of the territory west of Chicago.

On the Pacific Coast, a Section of the Illuminating Engineering Society would be at once profitable and desirable. Original research work and important and unique installations are of frequent occurrence here and it is imperative that these be given the greatest publicity, first from the view-point of pride of performance, second in that they are novel and embody many excellent features of importance to the industry, and third, that a knowledge of what has been accomplished and what has proven, for the time being, best, will, if properly disseminated, improve standards and so increase business. Presented before a section meeting and thoroughly discussed, the subjects become at once clarified and invested with authority.

This society was organized in 1906 and although no special membership campaigns have been conducted it now has about 1500 active members. It is a society, in the business of which, Consulting Engineers, Architects, Central Station Employees, Salesmen and in fact every branch of the industry and the allied professions may profitably participate.

The transactions of the society are issued nine times each year and total approximately 6000 pages; a considerable amount of space being devoted to the reports of original research work and the practical application of the principles involved.

Its activities make for higher standards, new ways and methods—the more excellent way—and bigger

business. It breathes in the spirit of co-operation. It is worthy your support if only for the reasons that it aims to educate the layman also as to what constitutes the best in illumination equipment and is thus responsible for increased business combined with greater satisfaction in the use of our product. The field is still however largely uncultivated as witness the many inefficient installations which transgress the first principles even, of what constitutes the best in illumination.

One annual convention and an annual meeting are held also six or eight meetings in each section city throughout the year. At the present time there are five sections located respectively in Boston, Chicago, New York, Philadelphia and Pittsburg.

The reason for the non-existence of a Pacific Coast Section may be due to the conservatism of the society. At no time has it been the policy to actively solicit membership but a measure of publicity is certainly essential in order that a "local" section be inaugurated at an early date.

Membership in the Illuminating Engineering Society plus active interest will ensure to all participants a wider knowledge and greater profits. The Journal would like to hear from all those interested in the formation of a Section.

Get Busy

An admission of slack times is often self-condemnatory. "Why is it," wrote Thoreau, "that men give so poor an account of their day if they have not been slumbering. If they had not been overcome with drowsiness, they would have performed something." It is that "something attempted, something done," which occasionally opens up the flood-gates of business prosperity.

We accept the circumstance as conclusive evidence that the condition is. But your news that it rained yesterday is not sufficient evidence that it will rain today, and similarly, that a certain period during each of a number of past years has been a "slack" season is not conclusive proof that the same season this year will also call for complaint. (Whatever good that would do.) Waiting until times are better before you hustle after business is to confess that you have heretofore been one of those who sold, not in the market place, but waited expecting that with so much business, the skies must shower customers upon you. In other words, you may have unwittingly developed the habit due perhaps to too great a "success" in the past, of waiting for the business to come to you instead of getting out even half-way, to capture it and bring it into camp.

There is greater than circumstances, the power that can and will change them.

That power is action. To sit repining—to complain—is to admit the superficial evidence of hearsay or appearance. Actually a form of mental laziness. Throughout the rush seasons there are always certain jobs which we promise to do when we are not quite so busy; there are certain new outlets for our trade which we intend to develop, certain new methods which we purpose trying out. Always, "when we are not quite so busy." Then when the so-called slack season does come, unless the individual prove an exception, all those things are neglected because "times are hard," "money tight" and "no one will do anything anyway."

But why not try, why not get action. That season in which your competitors lie down is the one during which your sales force should be most active, and despite appearances, the season during which you should do those things which have beeen left undone, develop new prospects and try out those new systems. At least try!

A single individual has often developed business sufficient to turn a slack season in the electrical business into a busy one, with the attendant increased activity for other occupations. Circumstances are man-made, and man can change them.

Let us in future not admit defeat before we try, but rather roused from our circumstance induced sleep, let us overcome that drowsiness which is mental laziness, and so give a good and profitable account of each day. So shall we perform something and prosperity come to us, for we shall be awake to the fact that in action is a power which will prove greater than any adverse circumstance we can experience.

The Question of Billboards

Some questions are perennial and one of these is of importance to the electrical industry in that a satisfactory reply implies, by analogy, the existence of another and excellent outlet for goods electrical. "What shall we do with the bill-board," is the ever recurring question to which we refer, and the reply is, "Do it electrically."

Yesterday, or perhaps it was the day before yesterday, incessant agitation against the painted and sometimes unsightly signs then projecting over the sidewalk, found a response in something done better—the electric sign—which with further improvements produced the wonderfully artistic, mechanically marvellous and brilliant creations which today add to the attractiveness and gaiety of cities and return to those responsible for their erection, such splendid dividends,

There are bill-boards and bill-boards. Some in place and some out of place, some good, some bad; others we might improve and again some that we would not even if we could. We are all familiar too, with those signs which are undesirable blots on the landscape. Such misplaced bill-boards, as do those crude, unsightly, or inartistic, excite unfavorable agitation and no one would regret their enforced removal. But on the other hand, properly encouraged and with permanency assured, bill-boards may be made attractive by day and even at this time comparatively brilliant and cheery by night.

The wonderful improvements in the electric sign point to the remarkable possibilities of the electrically illuminated bill-board if those responsible for them are encouraged in their efforts, instead of being discouraged by adverse criticism and legislation.

Restrictive ordinances are sometimes desirable but if they place a premium upon invention and progress and are so made destructive, then public opinion through the effort of some individual or association will revolt and the resultant forced concessions may hinder progress.

You can't make a country home out of a city residence, so why not work for bill-boards electrical which are better?

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Wm. Bromley, state electrician, Ukiah, was a recent visitor at San Francisco.

J. O. Presbey, salesman Holophane Works of G. E. Company, is at San Francisco.

G. C. Harris, president Home Telephone Company, Tulare, Cal., is at San Francisco.

F. M. Cooley, Tungstolier specialist, Western Electric Company, is on a visit to Seattle.

Garnett Young, manager Telephone Electric Equipment Company, has left on a trip East.

M. C. Osborn, contract agent, Washington Water Power Company, was at Seattle recently on business.

C. V. Schneider, Electrical Supply Company, Sacramento, was at San Francisco on a business trip last week.

H. F. Berg, of the firm of Metz & Berg, electrical contractors, Marysville, was at San Francisco on business during the past week.

R. W. Van Norden, consulting engineer, has returned to San Francisco from an inspection trip throughout Tulare county, California.

G. Douglas Jones, electrical engineer for the State Department of Engineering at Sacramento, Cal., was at San Francisco this week.

R. J. Sheets, Link River Electric Company, is at San Francisco on business in connection with the new Court House at Klamath Falls.

C. F. Gilchrist of the meter department, San Joaquin Light & Power Company, Fresno, was among the recent arrivals in San Francisco.

Geo. S. Pearce, city electrician, Sacramento, was at San Francisco last week in connection with the new series street lighting installation for that city.

J. H. Newland, purchasing agent of the San Joaquin Light & Power Company, recently dropped into San Francisco to see the sights of the Portola season.

W. Frank Carr, manager railway department, Parrott & Company, San Francisco, attended the convention of the American Electric Railway Association.

L. H. Baldwin, sales engineer, Kellogg Switchboard & Supply Company, has been transferred to Los Angeles to succeed **C. F. Hartung,** who has resigned.

A. G. Wishon, general manager, and **L. M. Pierce,** general superintendent of the San Joaquin Light & Power Company, Fresno, Cal., were recent visitors in San Francisco.

H. L. Bleeker, vice-president, Washington Water Power Company and president of the Northwest Light & Power Association, was at Seattle on business during the past week.

J. T. Stewart, formerly with the Holophane Works of General Electric Company, has accepted a position with the electrical department, Dunham, Carrigan & Hayden, San Francisco.

H. E. Linden, of the firm of Linden & Parcher, engineers and architects, Bishop, Cal., was at San Francisco in connection with the Mono Lake power hearing before the State Water Commission.

Frank Leonard, formerly refrigerating engineer with Swift & Company, and now associated with the Union Construction Company, Portland, Ore., spent the first part of last week in San Francisco.

W. W. S. Butler, former president of the Western States Gas & Electric Company, has returned to San Francisco, after an extended trip East, during which he spent considerable time at his old home in Virginia.

W. D'A. Ryan, illuminating engineer of the Panama-Pacific International Exposition, was a recent arrival in San Francisco from the East, where he has been for some time past in connection with exposition matters.

S. B. Anderson, district manager of the Pacific States Electric Company, San Francisco, left the latter part of the week on a business and vacation trip which will embrace the Pacific northwest and southern California.

A. H. Babcock, electrical engineer with the Southern Pacific Railroad, presented a paper on "Mountain Railway Electrification" at the meeting of the San Francisco Section of the American Institute of Electrical Engineers on October 31.

R. G. McDonald, engineer Mono Valley Improvement Company, Mono Lake, was at San Francisco to give expert testimony before the commission regarding a case in which certain irrigation, power and city water supply projects are involved.

O. B. Coldwell, general superintendent light and power department, Portland Railway, Light & Power Company, made an inspection trip over the company's system and was accompanied by **C. E. Condit, B. C. Condit, Mr. Merwin,** and **Mr. Walsh** of the Northwestern Electric Company.

W. N. Matthews, twelfth reigning Jupiter of the Jovian Order, has made the following appointments for the Pacific Coast: **Arthur E. Rowe,** sales manager Telephone & Electric Equipment Company, Statesman for San Francisco; **J. I. Colwell,** Western Electric Company, Seattle, Statesman for Western Washington.

O. P. McCord has been appointed to the sales force of the Westinghouse Electric & Manufacturing Company, San Francisco. He will represent the supply division devoting his time to city business. Mr. McCord is a graduate of the University of Atlanta and also of the training school of the Westinghouse company at Pittsburgh.

OBITUARY.

Joe Lazarus, who died recently at San Francisco, had but a short time since commenced in business as a manufacturers' agent. He was a member of the Sons of Jove.

MEETING NOTICES.

Portland Electrical Contractors' Association.

There was a good attendance at the regular meeting of the association held at the Portland Commercial Club on Wednesday evening, October 23d, at 6:30 o'clock, at which many matters of great importance to the welfare of the members were discussed.

Los Angeles Jovian Club.

Wm. Van Den Heuvel, consulting engineer, formerly with the U. S. Reclamation Service, gave an interesting talk at the Jovian Club lunch on Wednesday last, on the "Disposition of Aqueduct Power." His remarks constituted a "middle of the road" discussion of the power situation in Los Angeles. His conclusions, however, strongly favored the co-operative method of disposing of aqueduct power, using the existing distribution systems under some equitable arrangement with the power companies.

Alameda County Electrical Development League.

At the last regular meeting Mr. W. W. Briggs of the Great Western Power Company gave an informal talk to the members of the Electrical Development League of Alameda County last Saturday, at its regular monthly meeting. The subject of Mr. Briggs' talk was certain lines of co-operation between jobbers, dealers, contractors and other electrical fraternities, with particular reference to the central station situation. Needless to say, Mr. Briggs' talk was heartily appreciated by the members, about forty being present.

Utah Society of Engineers.

At the October meeting of the Utah Society of Engineers, Mr. M. Cheever, chief engineer of the Utah Power and Light

Company, described the extensive construction operations now in progress by his company, which include a double steel tower transmission line 135 miles long carrying two circuits of 5/8 inch copper wire from Grace, Idaho, to Salt Lake City. This line will transmit 100,000 kilowatts of electrical energy with a loss of but three per cent. The present transmission voltage from Grace is 44,000 volts. The voltage will be raised to 130,000 volts next spring, when the line is completed.

Portland Stationary Engineers.

Portland's stationary engineers, celebrating the twenty-first anniversary of the founding of the national association, entertained fellow craftsmen from Salem and Baker Wednesday night with a banquet at the Commercial Club. About 70 persons attended, though all were not engineers of the "stationary" type.

W. I. Barley, chief engineer of the Portland Railway, Light & Power Company, is vice-president of the local association and acted as toastmaster. Brief addresses were made by nearly everyone present, with "Education" as the general topic. Reports were made by Oregon's delegates to the international convention that recently was held in the east.

Oregon Society of Engineers.

Resolutions indorsing the appropriation for the University of Oregon have been adopted by the Oregon Society of Engineers, which represents more than 300 civil, mechanical, electrical and hydraulic engineers, in all parts of the state of Oregon. The organization also is on record favoring the maintenance of both the Oregon Agricultural College and the University of Oregon independent of one another. The association will take an active part in the campaign in support of the university appropriation during the next few weeks. The matter was first taken up by the engineers when the first intimations that a referendum might be filed against the State University were afloat and the institution was formally indorsed by an excursion of the engineers to Eugene last May.

San Francisco Electrical Development and Jovian League.

One of the most interesting and best attended meetings was held at the regular luncheon last Tuesday when the League first heard a very complete report from Mr. A. H. Halloran who represented California Jovians at the New York Jovian Convention, and later listened to an excellent address on "Scientific Salesmanship," by Mr. George H. Eberhard, general chairman Educational Committee and vice-president National Sales Managers' Association of America. The speaker first proved his point that there is a science of salesmanship and then briefly outlined the law of the sale; the necessity for securing attention, interest, desire and action were each presented in their logical order and all present were interested in the speakers' pertinent pointers regarding the proper closing of the sale.

The meeting next week will be under the guidance of the Jovians.

Los Angeles A. I. E. E.

Ernst M. Schmelz of Detroit presented a very interesting paper on the "Manufacture of Steel by Electricity" before the Los Angeles Section of the American Institute of Electrical Engineers. Mr. Schmelz described fully the construction of the Stassano electric furnace, one of which he has placed in service at Redondo. This is a three-phase proposition at 110 volts, and shows decided economies over other methods of steel manufacture. Other electrical features of the Stassano furnace are as follows: The load, amounting to about 1400 amp. per phase, is practically perfectly balanced on all phases. The electrodes are of carbon and of four in. diameter. The furnace uses about 900 kw.-hr. per charge. The cost of the steel product is $27.08 per ton, when operating continuously twenty-four hours each day. This cost is increased to $32.05, when operated for fifteen hours per day. This is on account of the necessity for keeping the furnace hot, as the magnesite brick, with which the furnace is lined, crack if permitted to cool.

TRADE NOTES.

The Pacific Underground Construction Company has the contract for installing ornamental electroliers at Hermosa Beach, Cal.

W. H. Smith Electrical Engineering Company has obtained the electrical contract for the four-story bank building located at Fourteenth and Burnside, Portland. The owners of the building are Mrs. Robert Tiegan and C. Van Fridagh.

Mathias Klein & Sons, Chicago, have recently occupied their new factory at Avondale. There is approximately 37,000 sq. ft. of floor space in the new factory which is up to date in every particular.

Among recent orders secured by the General Electric Company for turbo-generators is that of the Atchison, Topeka & Santa Fe for 2-300 kw., 3600 r.p.m., A. T. B. 480 volt condensing Curtis turbine generator sets with direct connected exciter, for use in their Richmond, Cal., shops.

The Holabird Reynolds Company of San Francisco has been awarded the contract to supply 33,000 ft. of metal moulding for the electrical equipment of the Napa insane asylum at Napa, Cal.; H. W. Johns-Manville Company were awarded the contract for 10,000 ft. of fibre conduit on the same job, while the Benjamin Electric Manufacturing Company will supply the lighting fixtures.

NEW CATALOGUES.

Catalogue No. 55 issued by the Holophane Works of the General Electric Company, lists their celebrated lines of Clearcut illuminating glassware, cut and etched.

Salesmen's portfolios of half-tones for use of the trade are being distributed by the Holophane Works of the General Electric Company, illustrating their line of portable lamps and semi-indirect bowls.

The Wagner Electric Manufacturing Company of St. Louis, Mo., has just issued a new bulletin, No. 103, describing their new single-phase converter. The bulletin deals with the construction and the operating characteristics of the machine and is profusely illustrated with engravings of the machine and its applications.

Bulletin No. A4137 by the General Electric Company, illustrates and describes that company's Curtis Steam Turbines of 100 to 2500 kw. capacity, for driving 60 cycle generators at 3600 r.p.m. These generating sets are of the horizontal shaft rigid frame type, and either two or four impulse wheels are used, depending upon the capacity of the generator. They embody all the latest developments in turbine construction. The bulletin is profusely illustrated, showing details of turbine construction, path of steam flow, and a number of typical installations.

The General Electric Company has issued Bulletin No. A4142, which deals with the various operating conditions which affect the efficiency and life of incandescent lamps. The subject is prefixed by an explanation of definitions, so that the context may be better understood. The advantages to the central station of maintaining high efficiency in the operation of incandescent lamps are analyzed, and curves showing the effects of variations in candlepower, wattage, and voltage, are included in this section. The value of high efficiency to the customer is alone treated and the effect of auxiliary apparatus on the lighting system is shown diagramatically and by analysis. The bulletin is well illustrated and will enable the reader to obtain a knowledge of all the conditions affecting the efficiency of incandescent lamps, and should be of considerable value to the illuminating engineer, central station, sales agent, and the consumer.

THE STATE OF CALIFORNIA WORKMEN'S COMPENSATION ACT.

BY J. R. MOLONY.

[Continued.]

I think you must have been in business long enough to realize that when you buy cheap supplies for use in your own work that you usually secure an article equal in value to the price paid, and there is no reason to apply any other theory to the purchasing of insurance and that applies to private companies selling below cost just so certainly as it will apply to this State Institution.

It is a regrettable fact that it takes little money, no experience and little ability, other than the ability to sell stock, to start an insurance institution and it is also a regrettable fact that many institutions of this kind are being and have been started in large numbers and you will realize that the sole business getting qualification of such an institution is low rates. I wish to say at this time in this connection, that such insurance under this Boynton Act is going to be a much more serious matter than insurance in irresponsible institutions has been heretofore. This must be realized when consideration is given to the enormous responsibilities imposed upon the employers under the schedule of compensation benefits and particularly the fact that life pensions must be paid running over a period of many years, which makes it imperative that an institution furnishing insurance be here to fulfill that obligation twenty-five years subsequent to the date of their contracts. It probably will be said by the representatives of such institutions, whether state or private, that the solvency of their companies is guaranteed by the reserve requirements of various states but the answer to that argument is apparent when you think for a moment that this reserve requirement has been in existence for many years past and in no one instance has it ever failed to permit the bankruptcy of any insolvent institution. There is little likelihood of these reserves being any more adequate in the future than in the past, providing a company is mismanaged. There is no question but that legal reserves now and for years to come, will be entirely too low. All one needs to determine this fact for himself is to glance at the published figures of costs in Germany relating to industrial accidents, which show that on all classes of business this cost has increased anywhere from 200 to 4000 per cent in the last thirty years. In my opinion it is preposterous to presume that competition will allow the charging of adequate rates for this insurance for years to come and unless this is done, legal reserves will not save improperly managed companies and it will only be those companies with the good judgment to properly rate and select their business and to maintain additional reserves beyond those required by law which will live to tell the tale.

I did not come here to solicit your business nor had I any intention of going into this phase of the question at this time in detail, but I do not believe in fairness to you that this subject should be discussed without this matter being called to your attention. If any of the gentlemen present care to investigate this subject further, you can do so by taking it up with representatives of any responsible insurance companies, or if you desire, I will be very glad to give you references to the experiences abroad so you may look the matter up for yourselves. These figures are matters of public record, have been published by the United States Department of Labor and are available in most all public libraries to anybody who is inclined to investigate and has the time to do so. If you have a committee appointed to discuss this subject, it cannot, in fairness to you or to itself, fail to investigate this phase of the business before any recommendation is made to your body with reference to the acceptance of a proposition from any company and that includes my own as well as others.

The safety provisions of this act present an exceedingly complicated subject and should be considered by themselves when more time can be devoted to the subject but in passing I will say that they require all places of employment to be made safe and place the responsibility for seeing that this is done on the shoulders of the Industrial Accident Department, through its superintendent. It provides also, that a representative of this department may determine the standards of safety for places of employment in this State and it is not required that these standards be uniform for the same plants in the same industry. This whole scheme was bitterly opposed by representatives of the Employers' Association on the ground that it placed unreasonable and dangerous powers in the hands of a board which could exaggerate those powers arbitrarily to the injury of individual employers at any time they might see fit. Notwithstanding this objection, the bill was passed with no material change and these powers are now vested in this board and it is highly essential that you inform yourselves in detail as to the requirements of the safety part of this act, otherwise you will be continually faced with the possibility of criminal prosecution for violation of it. To show you how serious this is, I will cite you only one section, No. 66, page 34, of the printed copies furnished by the Industrial Accident Board, which reads as follows:

"Every order of this commission, general or special, its rules and regulations, findings and decisions, made and entered under the safety provisions of this act shall be admissible as evidence in any prosecution for the violation of any of the said provisions and shall, in every such prosecution, be conclusively presumed to be reasonable and lawful and to fix a reasonable and proper standard and requirement of safety, unless, prior to the institution of the prosecution for such violation or violations, proceedings for a rehearing thereon or a review thereof shall have been instituted as provided in sections eighty-one to eighty-five, inclusive, of this act and not then finally determined."

Time will not permit any further discussion of this part of the Act but I would urge as forcibly as possible that you familiarize yourselves with this part of this Act if you desire to escape serious trouble later on.

The questions which naturally present themselves to your body for solution at this time are, first,—whether you desire for the balance of this year to file your election to become subject to the compensation portion of the Roseberry Law or to remain subject to Section 1 of it or that common law responsibility under it. I would suggest that in consideration of this you take it up with your insurance representatives, whoever they may be. They will be able to give you the costs under both parts of the act and furnish you any information which you may desire. You will have to decide what course you wish to pursue subsequent to January 1, 1914, the date upon which the Boynton Act becomes effective. You have open to you in the choice of your insurance carrier, the privilege of doing business with stock companies; becoming members of mutual institutions; purchasing insurance from the State Insurance Fund or carrying your own insurance. These are big questions and would consume considerable time to discuss. The two things, of course, which would be paramount in reaching your decision will be the cost of insurance and the solvency of your carriers. I have already taken all the time I feel I can on the question of solvency and on the state fund. The question of mutuals is one which you should give considerable thought before you accept membership in mutuals, imposing obligations which cannot lightly or quickly be disposed of and with unlimited liability for catastrophe hazards, which undoubtedly will be entirely inadequate to furnish you the protection needed unless the members of those small mutuals which may come into existence here, are willing to face the possibility of losses far beyond any cost to which they could ever be subjected by stock companies. When you think for a moment that mutuals operating here undoubtedly will limit their operations to California under this act, you will realize that they have no opportunity to

spread a catastrophe loss over the large number of risks possible where the insurance is carried by stock companies operating generally throughout the United States. Everyone knows that the theory of insurance fails absolutely when its application is to a limited number of risks in a limited area and I cannot see how small local mutuals can ever fill the needs of employers under such an act as this. The acceptance of a membership in such an institution is accompanied by grave responsibilities when you couple it with the payment of life pensions in unlimited numbers, which cannot possibly be anticipated by such an institution. While it is true that these mutuals will be forced to operate under the same reserve requirements as the stock companies, I wish again to point out the fact that legal reserves never have stopped insolvency and probably never will, although no institution can successfully administer this law without immense reserves, which no small organization can accumulate.

In this connection there is only one other thought I desire to suggest and that is that having determined the financial responsibility of your insurance carrier you have only then placed yourselves in a position to intelligently discriminate between policies offered you by different insuring companies. That is to say, an insurance company might be solvent beyond a question of a doubt and yet fail absolutely to offer you the protection which you ought to have. I believe I have suggested enough varying thoughts in connection with this Act so that you will appreciate the fact that a small company even though solvent, but without an organization sufficient to contend with the difficulties which must naturally arise in the administration of this Act, will be entirely unable to properly protect your interests and hold down the cost of insurance. If its corps of adjusters is not sufficiently large to cover the State and to permit of immediate, proper and complete investigation of accidents, the loss cost must mount up to a figure which will ultimately be reflected in your insurance rates. Coupled with this it is going to be absolutely imperative that the medical organization handling your cases be complete and experienced otherwise it will be absolutely impossible to determine the degree of disability upon any reasonable basis. You must appreciate that waste in any of these processes will be reflected in your individual loss experience, which will necessitate, undoubtedly, a higher cost to you individually than that to which employers in your class as a whole will be subjected if the merit rating system is adopted, as this idea is now coming into vogue throughout the country and is adopted by the state fund and will undoubtedly be adopted before many years throughout the State of California by all insurance carriers. This system requires that rates for all plants be made in accord with the experience on that plant and the physical condition of it. It is designed to rate such risks as present a high loss exposure either through improper management or low physical standard of safety, higher than the average and to rate such risks as present a low hazard, below the average. You must therefore readily appreciate that the day will come when companies which are, through lack of organization, improperly equipped to care for losses, will be instrumental in increasing your future rates. I believe you will, as business men, all agree with me that it costs money to maintain a proper organization, which should include in addition to their claims and medical organization, an inspection department and an audit department, if the rights of all parties concerned are to be protected. Granting this, you must also concede that those companies which do not maintain such departments as they should be, can, at the outset, offer you lower rates than companies which do. The question for you to determine in choosing your insurance carrier is, whether you want low rates today with a certainty of high rates in the future or whether you desire at this time a carrier which will offer you insurance at a fair rate which should remain as near stable as good business judgment and good underwriting sense will permit.

BOOK REVIEWS.

Technical Gas and Fuel Analysis. By Alfred H. White, 255 pp.; 5½x9 in.; cloth bound. Published by McGraw-Hill Book Company and for sale by Technical Book Shop, San Francisco. Price 2.

Technical Gas and Fuel Analysis is a volume of the International Chemical Series, H. P. Talbot, Ph.D., consulting editor. The author aims to present the conclusions of several national committees covering the testing of raw fuel and its manner of utilization and where there has been marked dissent from them..

Electrical and Magnetic Calculations. By A. A. Atkinson, M. S.; 310 pp.; 5x7½ in.; cloth bound. Published by D. Van Nostrand Company and for sale by Technical Book Shop, Rialto Bldg., San Francisco. Price $1.50.

Written for electrical engineers and artisans, teachers, students, and all interested in the theory and application of electricity and magnetism. This book has reached its fourth edition. It is an invaluable aid to acquiring a sound working knowledge of the underlying principles of the subjects, and is also a handy reference, covering the methods of applying the rules and formulae to practical engineering problems.

Farm Gas Engines. By C. F. Hirshfield, M. M. E., and T. C. Ulbricht, M. M. E.; 230 pp.; 5x8 in.; cloth bound. Published by Jno. Wiley & Sons, Inc., and for sale by Technical Book Shop, San Francisco. Price $1.50.

This publication is intended to serve as a guide to those contemplating the purchase of farm gas engines. The theory of the operation of such engines is discussed only to the extent necessary to enable the reader to appreciate what must be found in a reliable engine. So as to assist the prospective purchaser in deciding just what engines available best meets his needs, a chapter is devoted to prices and to those things which affect prices.

Single Phase Commutator Motors. By F. Creedy, A. C. G. I.; 109 pp.; 5½x9 in; cloth bound; published by D. Van Nostrand Company and for sale by Technical Book Shop, Rialto Bldg., San Francisco. Price $2.

This volume will be of value to those professionally interested in single-phase commutator motors and to the advanced technical student and teacher. A clear understanding of the phenomena of the operation of single-phase commutator motors is a necessary preliminary to improvements in practical application. The writer develops in this work simpler methods of studying the general theory of these machines than has been in use, so that it will be intelligible to any earnest reader.

Public Utilities, Their Cost and Depreciation. By Hammond V. Hayes, Ph. D., 262 pp.; 5x8½ in.; cloth bound. Published by D. Van Nostrand Company, and for sale by Technical Book Shop, San Francisco. Price $2.

The object of the work is to bring to the minds of those whose duty it is to ascertain values, first, that it is the duty of the appraiser, not to ascertain the fair present value, which function belongs to the courts or commission, but to ascertain with accuracy such figures as are necessary evidences of value and loss of value; second, that the original cost of a plant may be obtained without inordinate difficulty, and is a figure of importance to those who must rule as to what the fair present should be; and third, that depreciation is affected only indirectly by inefficiency and that, as a necessary consequence, depreciation is dependent solely upon the relation of the age to the life of the perishable property. It is the author's endeavor to present a fair method of arriving at a proper valuation on this basis.

The easy style of the author, together with excellent typography and paper, make comfortable reading. A study of the book is strongly recommended those interested in this subject.

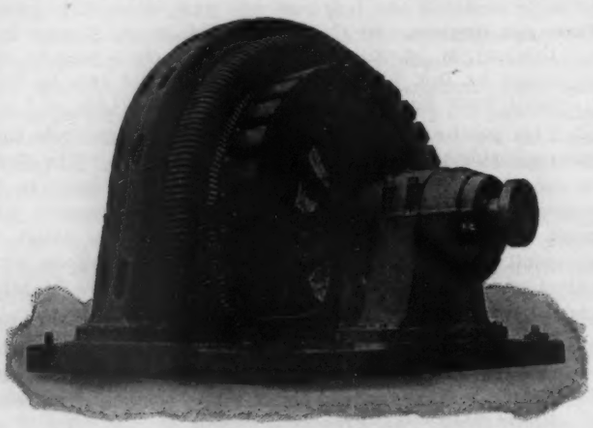
INDUSTRIAL

WESTINGHOUSE WATERWHEEL GENERATORS.

Waterwheel generators have recently been built to conform with the rapid development of hydraulic power for driving electric generators. The increased demands for such service require almost infinite combinations of capacity and speed range. Refinement in the design of both generators and waterwheels have made these changes possible; the successful operation of many high voltage transmission lines and the ever increasing demand for power, all aid materially in the utilization of many water powers heretofore considered either impracticable or inaccessible.

Two types of waterwheel generators are built—horizontal and vertical—depending upon the local conditions in each case.

Waterwheel generators of almost any practical capacity or speed for installation in the smallest isolated plant or the largest hydro-electric generating station have been furnished by the Westinghouse Electric and Manufacturing Company.



Horizontal Generator, Showing Method of Sliding Stator to One Side.

Horizontal Type.—The standard horizontal unit is of the two-bearing, coupled type construction; that is, the generator includes shaft, two-bearings, and a bedplate usually designed to allow for sliding the stator to one side in case ready access to either the stationary or rotating winding is desired.

The stationary frame is made of a strong, rigid iron casting, into which soft steel laminations are dovetailed and securely fastened.

Ventilating ducts are spaced at frequent intervals across the face of the armature punchings, allowing for perfect ventilation to all parts of the active material.

Form wound, interchangeable armature coils fit into parallel open slots punched in these laminations, and these coils are held firmly in place by means of fibre wedges. The coils are insulated and impregnated with fabrics and compounds of high insulating qualities.

No single type of construction will meet the varied requirements in rotor design, therefore, several well tested methods are employed. When comparatively low peripheral speeds are encountered a cast-iron spider with bolted-on, or dove-tailed poles, is usually employed. For higher speeds cast steel, or steel plate construction may be used. In the case of very large relatively high-speed machines, the difficulty of securing perfect castings may lead to the well-proven laminated rim structure.

All field poles are made of thin steel laminations riveted together with overhanging pole tips provided to support the field windings.

Field coils are wound of heavy copper strap on edge, insulated in such a way that each individual turn is exposed to the ventilating air, and thus perfect radiation results. The coil is securely fastened between the rotating spider and the tips of the field poles by heavy coil supports.

All parts are carefully inspected during each step in the process of manufacture, and before the succeeding operation is started. When completed the machine is carefully tested under conditions, as nearly identical as possible, to those which its future service will demand.

Vertical Type.—Westinghouse standard practice recommends that the generator be fitted with two guide bearings which are supported by brackets fastened to the stator frame. Also, a bedplate or pad on which the stationary part rests.

The roller, or thrust bearing, which supports the weight of the revolving part may be mounted on top of the generator frame between generator and turbine, or underneath the turbine. In case it is mounted on top of the generator frame, this frame must of course be made heavier and more expensive, than in cases where it has only to support the stator punchings, winding and guide bearings. Wherever placed this bearing usually supports not only the rotor of the generator, but also the turbine runner, and in addition takes care of any unbalanced water thrust.

A rigid cast iron frame into which soft steel laminations are securely dove-tailed, forms the basis of the stator.

The coils are vacuum dried and impregnated before the outside insulation is applied. This outside insulation consists of wrappings of paper and mica on the straight portions of the coils which lie in the slots, and servings of treated cloth over the V-shaped coil ends. After the outside insulation is applied the coils are treated with an insulating varnish which render them moisture and oil-proof. An insulating cell is provided in each armature slot to prevent abrasion of the coil and a fibre wedge holds coils and cell firmly in position.

In case of failure of a waterwheel governor to act, the rotating part of both waterwheel and generator are subjected to unusual stresses, due to the overspeeding of these parts. The rotors are designed for the maximum obtainable speeds which result in such instances. These overspeeds vary from 50 to 100 per cent. Due to the wide range of speeds encountered, no one type of rotor construction will give ideal results.

There are several designs of rotors, each one particularly well adapted for the requirements for which it is used. Comparatively low peripheral speeds may permit the use of a cast-iron spider with either bolted-on or dove-tailed poles. A higher speed generator may demand an entirely different construction. For such work cast-steel or rolled steel plates are often employed. In case of very large machines, it may be difficult to obtain perfect castings, and here the well-proven laminated rim may be employed.

SINGLE UNIT CAR FIXTURE.

A new single unit fixture has been developed by the Benjamin Electric Manufacturing Company, for street car and steam railway coach lighting which is neat in appearance and overcomes those difficulties which in the past prevented the proper installation of reflectors for this purpose. There are no projecting screws and the glassware is held in position by a cam arrangement which is finally locked so that the vibration of the cam cannot possibly jar it loose. This unit is No. 2377 and is designed for regular car lighting and to fully meet the severe conditions found in this service. It is an addition to the line of car lighting fixtures put on the market by this company and has the added advantage of the Benjamin lamp grip and a separable porcelain socket.

NEWS NOTES

INCORPORATIONS.

TAFT, CAL.—The incorporation is reported of the Domestic Water Company at $10,000, by T. W. Speed, W. C. Thiele and Marguerite Holmes.

SANTA BARBARA, CAL.—The American Gas Company has been incorporated with a capital of $75,000 by W. R. Rowland, T. W. Okey and W. V. Lockwood.

SANTA MONICA, CAL.—The Santa Monica Land & Water Company has been incorporated and the full amount of $1,000,000, subscribed by R. C. Gillis and J. J. Davis.

BAKERSFIELD, CAL.—The General Water Company has been formed with $50,000 capital; shares are $100 each; the incorporators being W. J. McLean, C. R. Stevens, Virgil Shaw, et al.

FULLERTON, CAL.—Articles have been filed by the El Camino Water Company, with Fullerton as the principal place of business. The company is a pumping plant proposition. Capital stock is $10,000. Incorporators are W. A. Goodwin, A. V. Vail, G. A. Gray, A. L. Porter and H. G. Meiser.

FINANCIAL.

LOS ANGELES, CAL.—The proposition made by the finance committee of the city council to the Pacific Electric Railway Company, that they accept payment in bonds for the work on the municipal railway on San Pedro street, has been approved by the railway company, which will immediately purchase $250,000 harbor bonds. This will make the amount set aside for the railway project available for harbor development.

LOS ANGELES, CAL.—The aqueduct power bonds will probably be voted on about November 18th. The Municipal League and the Chamber of Commerce have requested that the issue be segregated into two parts: $1,250,000 for the power development, and $6,250,000 for a distribution system. The majority of the city council, however, is in favor of but one issue, and is endeavoring to have the proposition submitted on that basis.

ILLUMINATION.

POCATELLO, IDAHO.—A cluster light system is being installed on West Center street and the system will soon be extended to other streets.

SAN FRANCISCO, CAL.—At the Land Show just closed, no less than 6000 Sunbeam Mazda lamps were used, ranging in size from 40 watt to 500 watt.

BAKER, CITY, ORE.—The contract has been awarded to the Capital Electric Company of Salt Lake for the furnishing of equipment for the municipal light plant with the exception of the water wheel which will be furnished by J. D. Sutter.

NAPA, CAL.—The railroad commission has granted authority to the Napa Valley Electric to purchase the property of the Calistoga Electric Company and to issue $20,500 of bonds, $15,300 of stock and $5000 of notes to pay for the property.

LONG BEACH, CAL.—K. T. Bennett has been awarded the contract at $11,434 for the installation of part of the ornamental lighting system, and the Woodhill & Hulse Electric Company were awarded a contract at $23,525 for similar work on Broadway, between Alamitos avenue and Water street.

LOS ANGELES, CAL.—The investigation and public hearing held in Los Angeles to secure data for fixing the wholesale rate for gas at the city limits, closed last Saturday. Commissioners Gordon and Thelen, assisted by a corps of experts, held their sessions in the council chamber at the city hall. The commissioners expect to make public their decision within thirty days. The Los Angeles Board of Public Utilities will then immediately announce the rate to be charged Los Angeles consumers for the mixture of natural and artificial gas.

BAKERSFIELD, CAL.—The California Natural Gas Company is arranging to run a 6 in. line to the county seat for the most part paralleling the present 4 in. main to the city limits. The line is to be 30 miles long. The contract for its laying has been let to the Virginia Pipe Line Contracting Company.

VANCOUVER, B. C.—The British Columbia Electric Railway Company has reduced its lighting rates in the Point Grey, Burnaby, Richmond, Delta, Surrey, Langley, Matsqui, Sumas, Chilliwack, Port Moody and other municipalities served by them on the mainland, to conform with the rates charged in the city of Vancouver.

NEWPORT BEACH, CAL.—The State Railroad Commission has granted to the Pacific Light & Power Corporation a certificate of public convenience, permitting them to furnish light and power to Newport Beach. A local company is now operating in this field, but it has been shown that their service and rates are such as to warrant competition.

KLAMATH FALLS, ORE.—Initial steps have been taken by the Klamath Falls City Council toward the construction of a municipal power plant on Link River that will furnish electric power for lights and all other purposes. That the U. S. Government is willing to enter into negotiations with the city for the sale of either water or electrical power was the statement made to the city administration, and acting on this, the council directed City Attorney J. C. Ruetenic to draw up a resolution that will start negotiations between the government and the city.

VICTORIA, B. C.—Street lighting in Victoria has undergone a very considerable change during the past year, and now consists either of magnetite arc or ornamental post lighting. The latter system has found considerable favor, and there are about 2000 standards in the down-town district. The style adopted is a cast iron 5-light standard spaced 80 ft., and the method of location 4 at street intersections, and the remainder opposite. The lamp used is 8 volt, 50 watt tungsten, with 12 in. C. R. I. globes. The lamps all burn until midnight, and alternate posts all night. The installation is paid for by the property owners and the current is supplied by the company and paid for by the city on a kw.-hr basis.

TRANSMISSION.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has closed a contract for furnishing to the Tacoma Dredging Company, on the Lake Washington canal, current amounting to 1200 h.p. This will be used in removing about 1,500,000 yards of dirt.

VICTORIA, B. C.—While Victoria is regarded as a residential city, the power business is one of no inconsiderable size, and extends from the smallest motor to several installations, which take from 2000 to 5000 h.p. each, the largest being in cement plants, having a load factor of approximately 85 per cent.

TACOMA, WASH.—An ordinance has been passed providing for the construction of an auxiliary electric transmission line for the Nisqually power plant from the substation at South Twenty-fifth and C streets in the city of Tacoma to the existing double line in Sec. 15, Twp. 17 N., R. 8, and to appropriate $12,000 for the work.

OGDEN, UTAH.—Joseph A. West, engineer for the Ogden Rapid Transit Company, started a corps of engineers in the field last week to complete the survey of the proposed electric line from Ogden to Logan. This move on the part of the Ogden Rapid Transit Company indicates that they contemplate extending their present interurban line from Brigham City to Logan.

SPOKANE, WASH.—Reclamation of 1,000,000 acres of land in eastern Washington, an expenditure of between $12,000,000 and $25,000,000 in development of one of the largest irrigation and power projects in the Northwest and opening up of the Priest Rapids country is expected to begin at once. Involved in the project is the electrification of the Chicago, Milwaukee & St. Paul Railway from Cascades to its Puget Sound terminal, the taking over of the Hanford irrigation project on the opposite side of the Columbia River and the merging and constructing of many electric railway lines, according to information said to have been gleaned from a member of the party, which headed by W. J. Close, of Close Bros., financiers of London, is visiting the scene of the project.

SAN FRANCISCO, CAL.—The hearing of the protest of Mono county farmers against the present granting of power rights on Rush and Lee Vining Creeks, in Mono county, to E. G. Ryan, occurred before the State Water Conservation Commission. The city of Los Angeles intervened in the suit and was represented by Attorney S. R. Robinson. The other litigants were the Mono Valley Improvement Company and the Rush Creek Mutual Ditch Company, represented by Attorney A. H. Swallow of Bishop. Those protesting contend that the carrying out of the Ryan water project would divert water from 90,000 acres of agricultural land and render it practically valueless.

QUINCY, CAL.—Notices of location of the waters of Indian, Red Clover and Last Chance Creeks for the purpose of mining, milling, irrigation, and the development of hydroelectric energy, were filed in the office of the county recorder last week. The locators are W. P. Frick of Alameda and the estate of H. E. Pickett, deceased, of Sacramento. The locations include those made by E. D. Bannister several years ago in the same section. The Indian Creek location is of 23 cu. ft. of water per second, which when landed at the power plant site will have a fall of 617 ft. and will produce 1700 theoretical h.p. of hydroelectric energy. The storage reservoir will have a capacity of 368,335,000 cu. ft. The Red Clover Creek unit will land 140 cu. ft. of water per second, with a fall of 1200 ft. at the power plant, producing 19,000 h.p. The Red Clover reservoir will store 864,000,000 cu. ft. of water and will have an area of 1322 acres. The Last Chance unit will deliver 100 cu. ft. of water per second, producing 13,600 h.p. of electrical energy, with a fall of 1200 ft. Its storage reservoir will contain 285 acres, and will have a capacity of 225,284,000 cu. ft. The total cost of the electric power development is estimated to be $1,860,475.

OGDEN, UTAH.—The accidental closing of a switch controlling the mechanism of a motor operated gate valve last Sunday afternoon completely flooded the Pioneer plant of the Utah Light and Railway Company, located about two miles from Ogden on the Ogden River. A man-hole cover on the turbine case had been removed to permit inspection of the turbine, and although there were two operators and several installers in the plant at the time the accident occurred, the rush of waters into the building was so rapid that the men were helpless, and were fortunate in escaping from the building with their lives. The accident to the plant interrupted service on the entire system. The rush of waters continued until the four miles of 6 ft. pipe had drained. By the time they had subsided the interior equipment and part of the walls of the building were a complete wreck. This unusual accident occurred just at the time that extensive alterations to this plant, which have been in progress during the past summer, were practically completed and the company were planning to put it back into service, preparing to handle the winter load. The Pioneer plant was one of the earliest hydroelectric plants to begin operation in Utah, as it was completed in 1896 at a cost of $1,500,000. The electric equipment and turbines installed at that time were so inefficient as compared with present day machinery that the company had discarded them and installed new equipment, which would have increased the capacity of the plant about 90 per cent. The full extent of the damage cannot be determined until the power house can be cleared out and an inspection made of the equipment.

TRANSPORTATION.

SEATTLE, WASH.—A. L. Kempster, general superintendent of the company, announces that the work of installing electric heaters on its long route cars will be done with all possible speed.

LOS ANGELES, CAL.—The city of Glendale has raised a bonus of $40,000 providing for an extension of the Pacific Electric Railway in that city. The new branch will leave the main line near San Fernando Road, Tropico, and will run north on Glendale avenue and will connect again with existing line at Casa Verdugo, thus creating a loop.

RIVERSIDE, CAL.—The railroad commission has refused permission for the Pacific Electric crossing over the Salt Lake on Magnolia avenue, Riverside. The commission has ruled that the street and electric railway tracks must be lowered, the cost to be borne equally by the Pacific Electric, the Salt Lake and the City of Riverside.

SAN FRANCISCO, CAL.—The supervisors' public utilities committee has declared in favor of building a branch of the Geary street municipal line along Masonic street, from Geary to Turk to connect with the baseball park proposed by J. Cal. Ewing, who told the committee that he would conclude the lease arrangement as soon as the recommendation was passed by the board.

STOCKTON, CAL.—At the last meeting of the city council an application made by the Stockton Terminal & Eastern Railway Company for permission to abandon portions of its franchise in this city was granted. Later a franchise for a single track will be sought along Miner avenue to connect the Miner avenue and Union street tracks. The company will not attempt to use its franchise along the bed of Miner Channel from Union to American.

SAN FRANCISCO, CAL.—There will be several kinds of intramural transportation for carrying visitors to any part of the grounds of the Panama-Pacific International Exposition. In addition to motor busses which will take a passenger to any point for ten cents, there will be a double track miniature railroad, which will give a four-mile ride for ten cents; electric jinrikshas, push chairs and bicycle chairs, the charges for which will be moderate.

RENO, NEV.—That an electric railroad connecting the town of Wellington, in Lyon county, and Reno is contemplated by Eastern capitalists is the assertion of men in a position to know. It is said to be the plan of those backing the movement to connect the road with Copper Belt line at Wellington and run the line through Carson Valley, touching Minden, Gardnerville and other towns in that vicinity, to Carson City. From Carson City the line will be carried direct to Reno. The distance is about 75 miles, and it is said that there is ample capital back of the project to put it through successfully. The power to operate the cars is to be furnished by the Truckee River General Electric Company and it is planned to carry freight and passengers, operating on a regular schedule.